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(54) **RESPIRATION DETECTING MEANS**

ATEMNACHWEISMITTEL

UNITE DE DETECTION DE RESPIRATION

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EP 1 874 189 B1

Description

[0001] The present invention is directed to a detecting means for detecting or generating measuring signals that are indicative of the respiration of a person.

[0002] EP 1 374 767 A2 discloses a measuring unit with a bag-like sensing unit which is held by a beltlike fixing member wrapped around the subject's body. The measuring unit comprises adhesion members for attaching both ends of the fixing member. The adhesion members are configured as a zipper or a plane fastener.

[0003] US 5 191 893 A, US 5 727 562 A, and US 2001/0007923 A1, US 5 022 402 A, and US 5 864 291 A respectively disclose respiratory measuring devices comprising a belt.

[0004] US 4 664 129 A discloses an optical movement sensor for detecting deformation of a human body. The movement sensor consists of a belt with a buckle and a light-transmitting sensor element.

[0005] US 5 074 299 A discloses a monitor for controlling the flow of respiratory gases using a nasal cannula or a pneumatic breathing belt.

[0006] It is the object of the present invention to provide a detecting means for detecting or generating signals that are indicative of the respiration of a person, wherein said detecting means can be used advantageously in view of hygiene and stands out due to a simple and robust configuration.

[0007] Detecting means as defined by the independent claims are provided. The dependent claims define embodiments.

[0008] According to the present invention, the above object is achieved by a detecting means for detecting a signal that is indicative of the activity of the respiratory muscles of a person to be examined, said means comprising a band means which, in the application position, is passed around a torso region which widens and narrows in response to the respiration of the person to be examined, as well as a structure that is included in the band means and loaded in accordance with the narrowing or widening of the torso region, wherein said structure is configured such that it causes a change in the volume of a measuring space means depending on a tensile force.

[0009] It is thus advantageously possible to detect or measure the forces acting on the band means in a non-electric manner and, on the basis of this detection or measurement, draw conclusions relating to the widening or narrowing of the torso.

[0010] In accordance with a first aspect of the present invention, the structure is configured as a buckle means. Said buckle means can be realized like a belt buckle and comprise bracket portions through which the respective end portions of the band means are passed. The buckle means can comprise adjusting means, e.g., clamping means or adjusting eyelets which allow a respective fixing, in particular clamping of the end portions of the band means.

[0011] In accordance with the first aspect of the present invention, the detecting means is configured such that the change in the volume of the measuring space means is caused by squeezing or compressing an elastically deformable chamber means realized by a tube portion.

[0012] It is possible to pass the tube portion in such a manner through the buckle means that the tube portion is squeezed in accordance with the respiration-synchronously changing tensile loading of the belt means. In response to said squeezing, the interior of the tube portion is changed. The resulting displacement of the air in the tube portion can be detected by means of pressure measuring means or small volume flow sensors and used for generating the signals that are indicative of the tensile loading.

[0013] In accordance with the first aspect of the present invention, the buckle means is divided in two segments. These two segments are configured such that they alternatingly surround the tube portion and squeeze it under the influence of respective tensile forces acting on the individual segments.

[0014] It is possible to configure the walls which alternatingly surround the tube portion in such a manner with respect to their geometry that a favorable squeezing or relaxation of the tube portion is obtained under the influence of said tensile forces.

[0015] The change in the volume which is caused by loading the measuring space means in accordance with the present invention can advantageously be transferred via a measuring tube arrangement to a measuring means, hi the area of this measuring means there is preferably a pressure-sensitive structure which converts the respiration-synchronously changing pressure in the measuring tube into suitable analog or digital signals.

[0016] Said measuring means can be configured such that a plurality of measuring tube means can be coupled thereto for realizing a corresponding multi-channel recording.

[0017] The above detecting means for detecting respiration-synchronously changing tensile forces in a belt system being passed around the torso region of the person to be examined can be configured such that particularly relevant respiration-motor or respiration-mechanic properties can be detected in an advantageous manner.

[0018] The present invention is further directed to a measuring arrangement which comprises a detecting means of the kind described above, wherein said measuring arrangement further comprises a measuring tube and a measuring means which is coupled via said measuring tube with the detecting means for recording the tensile force detection of the band means caused by the detecting means.

[0019] This measuring arrangement allows a potential-free signal measurement from the patient, thereby avoiding electrically conducting structures.

[0020] This measuring means is advantageously configured such that its signal recording capacity extends over a pressure signal range including also any pressure

signals measured by nose glasses means.

[0021] The measuring arrangement can comprise a storage medium, in particular an exchangeable storage medium, e.g., in the form of a memory card or in particular a USB flash stick. The measuring means preferably further comprises a receiving means for receiving a battery means for operating the measuring means independent from the network and/or in a wireless manner. The measuring means can be configured as an ambulant, compact module or recording means which can be carried by the patient and comprises a housing means having a flat configuration.

[0022] The detecting means of the present invention cannot only be used for diagnosing the respiratory behavior in a user, but it can also be integrated in a respiratory system if required, wherein the measuring signals generated by the detecting means can be taken into consideration in the further control of the respiratory gas supply. The detecting means of the present invention is particularly suitable for detecting the sleep respiration of a person to be examined. However, the field of application of said detecting means is not limited to the medical field. In particular, it can also be used in different applications for monitoring the respiratory motoricity, in particular for optimizing respiration.

[0023] The band means can be configured as a disposable band means so that for each patient to be examined a new band means can be used and coupled to the buckle means. It is also possible to provide a tube-like disposable attachment or other hygiene cover, e.g., from a hygiene paper, by means of which the above detecting means or at least its band and buckle means can be covered. It is possible to configure the detecting means, in particular the buckle means, the band means and optionally also the measuring tube as a disposable unit which can be disposed of after the measurement.

[0024] It is possible to provide spring-type or other calibration possibilities which guarantee, on the one hand, a sufficient pre-stressing of the belt placed around the patient and, on the other hand, a sufficient ability to widen the thus formed loop. It is possible to realize the band material intended for forming the belt in a relatively tension-proof manner and to generate the required flexibility by structures, e.g., spring or rubber mechanisms, provided in the region of the buckle means. However, it proves to be particularly advantageous to select the band material such that it has a sufficient elasticity and the buckle means essentially only functions as a force measuring means.

[0025] Further details and features of the present invention can be taken from the following description in combination with the drawings in which

Figure 1 is a principle view for explaining the structure of a preferred variant of the detecting means of the present invention,

Figure 2 is a sketch for explaining the load and the resulting change in the volume of a tube portion,

Figure 3 is a torso sketch showing the application of a detecting means of the present invention,

Figure 4 is a further torso sketch illustrating a further way of guiding the band, optionally for a plurality of measuring channels, for an extended examination of the respiratory activity,

Figure 5 is a further torso sketch further illustrating a further way of guiding the band for detecting the respiratory activity,

Figure 6 is a simplified illustration for explaining a further variant of a measuring transducer of the present invention,

Figure 7 is a sketch for explaining a plug-in sensor variant of the detecting means of the present invention,

Figure 8 is a simplified illustration for explaining the structure of a measuring means for converting the recording of the respiration-synchronously alternating pressure signals generated by means of the detecting means of the present invention.

[0026] The detecting means shown in Figure 1 serves for detecting a signal that is indicative of the activity of the respiratory muscles of a person to be examined. Said detecting means comprises a band means 1 which - in the application position (cf. Figure 3) - is passed around a torso region which widens upon inspiration of the person to be examined and narrows accordingly upon expiration. The band means includes a structure being configured as a buckle means 2 and being loaded upon widening of the torso region by the tensile forces Fa, Fb accordingly acting in the band means 1. Said structure is configured such that it causes a change in the volume of a measuring space means 3.

[0027] In the shown embodiment the structure is a buckle means 2, as already mentioned. The change in the volume of the measuring space means 3 is caused by squeezing elastically deformable walls of the measuring space means 3. In the shown embodiment, the elastically deformable walls form an elastic chamber means which as such is realized by a tube portion 4. The ends of the tube portion 4 are closed by an insert 5. The tube portion 4 is surrounded by eyelet portions 6, 7 alternatingly belonging to a left segment 2a and a right segment 2b.

[0028] The shown mechanism allows a squeezing of the tube portion 4 in accordance with the tensile forces Fa, Fb acting on the belt means 1. By squeezing the tube portions 4, the volume of the measuring space means 3

formed by the tube portion 4 changes. Due to the change in the volume, the included air is displaced, in particular moved out. This air displacement can be detected in particular if the measuring tube 8 is closed to a large extent by a measuring means which will be explained in detail below. It is possible to provide a bypass throttle bore 9 in the measuring tube 8 or in particular in the plug or connector 5 or also in the region of the measuring means. By means of this throttle bore it is possible to realize a high-pass filter which guarantees that the average pressure in the measuring tube means 8 corresponds for a long time to the ambient pressure and no deviation takes place.

[0029] Figure 2 is a sketch showing how the tube portion 4 of the measuring tube 8 is loaded by the forces FA, FB coupled in via the segments 2a, 2b. Due to the shown loads, the tube portion 4 of the measuring tube 8 deforms from the initial state having an inner cross-section A1 as shown in sketch S1 into the squeezed deformed state shown in sketch S2. In this deformed state the tube portion 4 has an inner cross-section A2 being smaller than the inner cross-section A1 shown in sketch S1.

[0030] It is possible to configure the eyelets or squeezing structures surrounding the tube portion 4 in such a manner as regards their geometry that they favor or at least do not considerably hinder the deformation of the tube portion 4. To this end, the eyelet portions preferably have an opening cross-section which is larger than the outer cross-section of the measuring tube portion 4.

[0031] As shown in Figure 3, the detecting means of the present invention is particularly suitable for detecting the widening and narrowing of the torso 10 of a person to be examined. The band means 1 is passed around the torso 10. The band means 1 includes the structure which, in the present case, is configured as a buckle means 2. The tensile forces acting on the band means 1 as the torso 10 widens are detected by the squeezing of a measuring space means 3 caused by the buckle means 2 (cf. Figure 1).

[0032] Figure 4 shows a further way of guiding the band. On the basis of the tensile force measuring principle of the detecting means of the present invention it is possible to realize a multi-channel measuring system by means of which respiration-motor properties of the respiration of the patent to be examined can be recorded in a multi-channel manner. For example, it is possible to detect, in addition to an elongation of the lower band means 1', also an elongation or widening of the upper band means 2a, 2b shown in Figure 4.

[0033] Figure 5 shows a further way of guiding the band. In accordance with this variant it is possible to detect, in addition to a widening of the upper portion of the torso 10 by the upper band means 1', also movements of the respiration muscles in the area of the diaphragm by means of a band means 1c that is arranged further below and extends over the lower lung area. In this variant, too, it is possible to additionally record tensile forces in the band regions 2a and 2b in a multi-channel manner by accordingly coupling them in a detecting means of the present invention.

[0034] Figure 6 shows a further variant of a pneumatic measuring transducer of the present invention. In this variant, the respiration-synchronously alternating tensile forces Fa, Fb prevailing in the band means 1 cause a change in the volume of the measuring space means 3. In this embodiment, too, the measuring space means 3 is included in a bracket means 2 comprising left and right bracket portions 2a', 2b'. In this embodiment, the measuring space means is also configured as an elastically deformable structure and comprises a portion which can be accordingly widened in response to the tensile forces acting on the band means 1. In this embodiment, this portion is realized as a corrugated sheathing portion 20. A spring means 21, by means of which a specific preloading of the detecting means is achieved, is embedded in the corrugated sheathing portion 20. It is possible to realize said spring means 21 as part of a calibration system. Via a measuring tube means 8, the change in the pressure and/or volume in the area of the measuring space means 3 can be detected via corresponding connection channels 22 and supplied to a corresponding measuring means. Different from the squeezing variant, in this mechanism the measuring chamber volume is increased as the band widens (inspiration) and thus a measuring signal is obtained which is reversed relative to the measuring signal of the squeezing variant.

[0035] Figure 7 shows a variant of the measuring space means 3 which as such comprises an elastically deformable tube portion 4, similar to the above description relating to Figure 1.

[0036] Deformation of this tube portion 4 directly leads to pressure changes in the interior of the measuring space means 3. Said pressure changes can be detected by a miniaturized measuring transducer means 25 and transmitted to a detachably coupled storage means 26, in the present case a USB flash stick. The shown means can comprise an energy storage means, e.g., in the form of a button cell battery. It is also possible to realize the measuring transducer circuit such that the energy required for generating and recording signals is provided directly by the pressure sensor.

[0037] Figure 8 shows a measuring means provided for converting and recording signals generated by means of the detecting means described above. Said measuring means 30 is configured as a multi-channel measuring means. An end portion of the measuring tube 8 can be coupled (e.g. inserted into a receiving bore or put on a measuring connection) to said measuring means 30. The pressure changes coupled in the measuring tube 8 during the respiration-synchronous squeezing of the tube portion 4 (cf. Figure 1) can be recorded by the shown measuring means and preferably stored in digital form.

[0038] The measuring means 30 is configured such that it can be activated by a switch means 31. The pressure fluctuations passed by the measuring tube 8 to the measuring means 30 can be recorded in accordance with

different recording concepts which are preferably stored in the measuring means 30 in a program-based manner. Recording can preferably take place in such a manner that the course of the individual breaths of the person to be examined can be determined with a relatively high resolution (high-resolution raw data recording). It is possible to use the shown measuring means 30 in addition to the conventional recording of the respiration of the patient for diagnosis purposes also for further controlling the respiration of the patient by pressure.

[0039] It is possible to configure the measuring means 30 such that it is also possible to record signals that are indicative of the nasal or oral respiratory gas flow of a person to be examined. In the shown variant, the measuring means 30 comprises further connection portions 40, 41 via which also pressure signals can be coupled for the purpose of further recording which can be measured, e.g., by a nose glasses means or other detecting means for detecting the respiratory gas flow from the patient to be examined.

[0040] In accordance with a further aspect of the present application the detecting means may also comprise a measuring channel for generating a recording signal that is indicative of the oxygen saturation of the blood. To this end, the detecting means 30 can be configured such that it can be connected to a light guide means 60 for introducing light measured at the patient, e.g., in the area of the nose wings or the extremities, in particular fingers. The light guide can have a plurality of conductors so that the light directed to the patient for the purpose of examination can be generated in the area of the measuring means and guided to the patient via the additional light guide, if required. The reflected light measured at the patient can be returned via the second light guide. Tissue portions with good blood supply, in particular finger tips, the area surrounding the ear and nasal areas, are particularly suitable as measuring positions. The light guides can be attached to these portions by means of suitable application structures. It is possible to provide the light guides with a relatively small coupling head which can otherwise be fixed to the patient by means of an adhesive tape or any other adhesive bandage material.

[0041] In the shown measuring means it is possible to measure numerous polysomnographic measuring parameters of a patient in a completely non-electric manner and without use of electrically conductive structures. It is possible to integrate the light guide means 60 in the measuring tube 8 and/or manufacture the measuring tube 8 from a material which is directly suitable as a light guide. The measuring means can also comprise further recording systems and channels, in particular for ECG, EEG or other body-electric potential signals.

Claims

1. A detecting means for detecting a signal that is indicative of the activity of the respiratory muscles of a person to be examined, said detecting means comprising a band means (1) which is passed around a torso region (10) which widens and narrows in response to the respiration of a person to be examined as well as a structure which is included in the band means (1) and is loaded by said band means in accordance with the narrowing and widening of the torso region,
wherein said structure is configured such that it causes a change in the volume of a measuring space means, **characterized in that**
the structure is configured as a buckle means (2), the measuring space means is located within said buckle means (2), wherein the change in the volume is realized by squeezing elastically deformable walls of the measuring space means which form an elastically deformable chamber means realized by a tube portion (4) that is squeezed by the buckle means (2) in accordance with the tensile loading of the band means (1), and
the buckle means (2) is divided into two segments (2a, 2b), and the two segments (2a, 2b) surround the tube portion (4) for squeezing it depending on the tensile force.

2. The detecting means according to claim 1, **characterized in that** the walls surrounding the tube portion (4) have such a geometry that deformation conditions are obtained which are favorable as regards the squeezing of the tube portion (4) depending on the tensile force.

3. A detecting means for detecting a signal that is indicative of the activity of the respiratory muscles of a person to be examined, said detecting means comprising a band means (1) which is passed around a torso region (10) which widens and narrows in response to the respiration of a person to be examined as well as a structure which is included in the band means (1) and is loaded by said band means in accordance with the narrowing and widening of the torso region,
wherein said structure is configured such that it causes a change in the volume of a measuring space means, **characterized in that**
the structure is configured as a bracket means (2) comprising two bracket portions (2a', 2b'),
wherein the measuring space means is located within said bracket means (2), wherein the measuring space means is configured as an elastically deformable structure, and the change in the volume of the measuring space means is realized by widening a portion of the elastically deformable structure, and
wherein the elastically deformable structure comprises a corrugated sheathing portion (20) and a spring (21).

4. The detecting means according to claim 3, wherein the corrugated sheathing portion (20) and the spring (21) are widened by the bracket means in response to the tensile loading of the band means (1).

5. The detecting means according to any one of claims 1-4, further comprising a measuring channel for generating a recording signal indicative of oxygen saturation of the persons blood.

6. The detecting means according to any one of claims 1-5,
wherein the band means (1) is configured as a disposable band means, or
wherein the buckle or bracket means (2), the band means (1), and optionally also the measuring tube (4) are configured as a disposable unit.

7. The detecting means according to at least one of claims 1 to 6, **characterized in that** the detecting means forms part of a multi-channel measuring system.

8. The detecting means according to at least one of claims 1 to 7, **characterized in that** a change in the volume depending on the tensile force is passed on to a measuring means (30) by means of a measuring tube arrangement (8).

9. The detecting means according to claim 8, **characterized in that** the measuring means (30) comprises a signal recording means.

10. A measuring arrangement comprising a detecting means according to at least one of claims 1 to 9, said measuring arrangement further comprising a measuring tube (8) and a measuring means which is coupled to the detecting means by means of the measuring tube (8) for recording the tensile force measuring signals measured by the detecting means.

11. The measuring arrangement according to claim 10, wherein the measuring arrangement further comprises a storage means (26).

12. The measuring arrangement according to claim 10, **characterized in that** the measuring means is configured to record signals indicative of nasal or respiratory gas flow of the person to be examined.

Patentansprüche

1. Erfassungseinrichtung zum Erfassen eines Signals, das die Aktivität der Atmungsmuskulatur einer zu untersuchenden Person anzeigt, wobei die Erfassungseinrichtung eine Bandeinrichtung (1), die um einen Rumpfbereich (10) angelegt wird, der sich als Reaktion auf die Atmung der zu untersuchenden Person erweitert und zusammenzieht, sowie eine Struktur aufweist, die in der Bandeinrichtung (1) enthalten ist und durch die Bandeinrichtung gemäß der Erweiterung und dem Zusammenziehen des Rumpfbereichs belastet wird,

wobei die Struktur derart konfiguriert ist, dass sie eine Änderung des Volumens eines Messraums verursacht;
dadurch gekennzeichnet, dass
die Struktur als eine Schnalleneinrichtung (2) konfiguriert ist;
der Messraum innerhalb der Schnalleneinrichtung (2) angeordnet ist, wobei die Änderung des Volumens durch Drücken elastisch verformbarer Wände des Messraums realisiert wird, die eine elastisch verformbare Kammer bilden, die durch einen Schlauchabschnitt (4) gebildet wird, der durch die Schnalleneinrichtung (2) gemäß der Zugbelastung der Bandeinrichtung (1) gedrückt wird, und
die Schnalleneinrichtung (2) in zwei Segmente (2a, 2b) geteilt ist, wobei die beiden Segmente (2a, 2b) den Schlauchabschnitt (4) umgeben, um ihn in Abhängigkeit von der Zugkraft zu drücken.

2. Erfassungseinrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die den Schlauchabschnitt (4) umgebenden Wände eine derartige Geometrie haben, dass Verformungsbedingungen erhalten werden, die hinsichtlich des Drückens des Schlauchabschnitts (4) in Abhängigkeit von der Zugkraft vorteilhaft sind.

3. Erfassungseinrichtung zum Erfassen eines Signals, das die Aktivität der Atmungsmuskulatur einer zu untersuchenden Person anzeigt, wobei die Erfassungseinrichtung eine Bandeinrichtung (1), die um einen Rumpfbereich (10) angelegt wird, der sich als Reaktion auf die Atmung der zu untersuchenden Person erweitert und zusammenzieht, sowie eine Struktur aufweist, die in der Bandeinrichtung (1) enthalten ist und durch die Bandeinrichtung gemäß der Erweiterung und dem Zusammenziehen des Rumpfbereichs belastet wird,

wobei die Struktur derart konfiguriert ist, dass sie eine Änderung des Volumens eines Messraums verursacht;
dadurch gekennzeichnet, dass
die Struktur als eine Haltereinrichtung (2) konfiguriert ist, die zwei Halterabschnitte (2a', 2b') aufweist,
wobei der Messraum innerhalb der Haltereinrichtung (2) angeordnet ist, wobei der Messraum als eine elastisch verformbare Struktur

konfiguriert ist, und wobei die Änderung des Volumens des Messraums durch Erweitern eines Abschnitts der elastisch verformbaren Struktur realisiert wird, und
wobei die elastisch verformbare Struktur einen gerippten Hülsenabschnitt (20) und eine Feder (21) aufweist.

4. Erfassungseinrichtung nach Anspruch 3, wobei der gerippte Hülsenabschnitt (20) und die Feder (21) durch die Haltereinrichtung als Reaktion auf die Zugbelastung der Bandeinrichtung (1) erweitert werden.

5. Erfassungseinrichtung nach einem der Ansprüche 1 bis 4, ferner mit einem Messkanal zum Erzeugen eines eine Sauerstoffsättigung des Bluts einer Person anzeigenden Aufzeichnungssignals.

6. Erfassungseinrichtung nach einem der Ansprüche 1 bis 5,

wobei die Bandeinrichtung (1) als eine Einwegbandeinrichtung konfiguriert ist, oder
wobei die Schnalleneinrichtung oder die Haltereinrichtung (2), die Bandeinrichtung (1) und optional auch der Messschlauch (4) als Einwegeinheit konfiguriert sind.

7. Erfassungseinrichtung nach mindestens einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Erfassungseinrichtung einen Teil eines Mehrkanalmesssystems bildet.

8. Erfassungseinrichtung nach mindestens einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** eine Änderung des Volumens in Abhängigkeit von der Zugkraft durch eine Messschlauchanordnung (8) einer Messeinrichtung (30) zugeführt wird.

9. Erfassungseinrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** die Messeinrichtung (30) eine Signalaufzeichnungseinrichtung aufweist.

10. Messanordnung mit einer Erfassungseinrichtung nach mindestens einem der Ansprüche 1 bis 9, wobei die Messanordnung ferner einen Messschlauch (8) und eine über den Messschlauch (8) mit der Erfassungseinrichtung verbundene Messeinrichtung zum Aufzeichnen der durch die Erfassungseinrichtung gemessenen Zugkraftmesssignale aufweist.

11. Messanordnung nach Anspruch 10,
wobei die Messanordnung ferner eine Speichereinrichtung (26) aufweist.

12. Messanordnung nach Anspruch 10, **dadurch gekennzeichnet, dass** die Messeinrichtung dafür konfiguriert ist, Signale aufzuzeichnen, die einen nasalen oder respiratorischen Gasdurchfluss der zu untersuchenden Person anzeigen.

Revendications

1. Moyen de détection pour détecter un signal qui est indicatif de l'activité des muscles respiratoires d'une personne à examiner, ledit moyen de détection comprenant un moyen de bande (1) qui est passé autour d'une région torse (10) qui s'élargit et rétrécit en réponse à la respiration d'une personne à examiner ainsi qu'une structure qui est incluse dans le moyen de bande (1) et est chargée par ledit moyen de bande conformément au rétrécissement et à l'élargissement de la région torse,
dans lequel ladite structure est configurée de telle sorte qu'elle entraîne un changement du volume d'un moyen d'espace de mesure, **caractérisé en ce que** la structure a la configuration d'un moyen de boucle (2),
le moyen d'espace de mesure se situe dans ledit moyen de boucle (2), dans lequel le changement du volume est réalisé en comprimant des parois élastiquement déformables du moyen d'espace de mesure qui forment un moyen de chambre élastiquement déformable réalisé par une portion de tube (4) qui est comprimée par le moyen de boucle (2) conformément à la charge en traction du moyen de bande (1), et
le moyen de boucle (2) est divisé en deux segments (2a, 2b), et les deux segments (2a, 2b) entourent la portion de tube (4) pour la comprimer en fonction de la force de traction.

2. Moyen de détection selon la revendication 1, **caractérisé en ce que** les parois entourant la portion de tube (4) ont une géométrie telle que l'on obtient des conditions de déformation qui sont favorables en matière de compression de la portion de tube (4) en fonction de la force de traction.

3. Moyen de détection pour détecter un signal qui est indicatif de l'activité des muscles respiratoires d'une personne à examiner, ledit moyen de détection comprenant un moyen de bande (1) qui est passé autour d'une région torse (10) qui s'élargit et rétrécit en réponse à la respiration d'une personne à examiner ainsi qu'une structure qui est incluse dans le moyen de bande (1) et est chargée par ledit moyen de bande conformément au rétrécissement et à l'élargissement de la région torse,
dans lequel ladite structure est configurée de telle sorte qu'elle entraîne un changement du volume d'un moyen d'espace de mesure, **caractérisé en ce que** la structure a la configuration d'un moyen de support (2) comprenant deux portions de support (2a', 2b'),

dans lequel le moyen d'espace de mesure se situe dans ledit moyen de support (2), dans lequel le moyen d'espace de mesure a la configuration d'une structure élastiquement déformable, et le changement du volume du moyen d'espace de mesure est réalisé en élargissant une portion de la structure élastiquement déformable, et
dans lequel la structure élastiquement déformable comprend une portion de gainage ondulée (20) et un ressort (21).

4. Moyen de détection selon la revendication 3, dans lequel la portion de gainage ondulée (20) et le ressort (21) sont élargis par le moyen de support en réponse à la charge de traction du moyen de bande (1).

5. Moyen de détection selon l'une quelconque des revendications 1-4, comprenant en outre un canal de mesure pour générer un signal d'enregistrement indicatif de la saturation en oxygène du sang de la personne.

6. Moyen de détection selon l'une quelconque des revendications 1-5,
dans lequel le moyen de bande (1) a la configuration d'un moyen de bande jetable, ou
dans lequel le moyen de boucle ou de support (2), le moyen de bande (1), et éventuellement également le tube de mesure (4), ont la configuration d'une unité jetable.

7. Moyen de détection selon au moins l'une des revendications 1 à 6, **caractérisé en ce que** le moyen de détection forme une partie d'un système de mesure à canaux multiples.

8. Moyen de détection selon au moins l'une des revendications 1 à 7, **caractérisé en ce qu'**un changement du volume en fonction de la force de traction est transmis à un moyen de mesure (30) à l'aide d'un agencement de tube de mesure (8).

9. Moyen de détection selon la revendication 8, **caractérisé en ce que** le moyen de mesure (30) comprend un moyen d'enregistrement de signal.

10. Agencement de mesure comprenant un moyen de détection selon au moins l'une des revendications 1 à 9, ledit agencement de mesure comprenant en outre un tube de mesure (8) et un moyen de mesure qui est couplé au moyen de détection à l'aide du tube de mesure (8) pour enregistrer les signaux de mesure de force de traction mesurés par le moyen de détection.

11. Agencement de mesure selon la revendication 10, dans lequel l'agencement de mesure comprend en outre un moyen de stockage (26).

12. Agencement de mesure selon la revendication 10, **caractérisé en ce que** le moyen de mesure est configuré pour enregistrer des signaux indicatifs d'un écoulement de gaz respiratoire ou nasal de la personne à examiner.

Fig.1

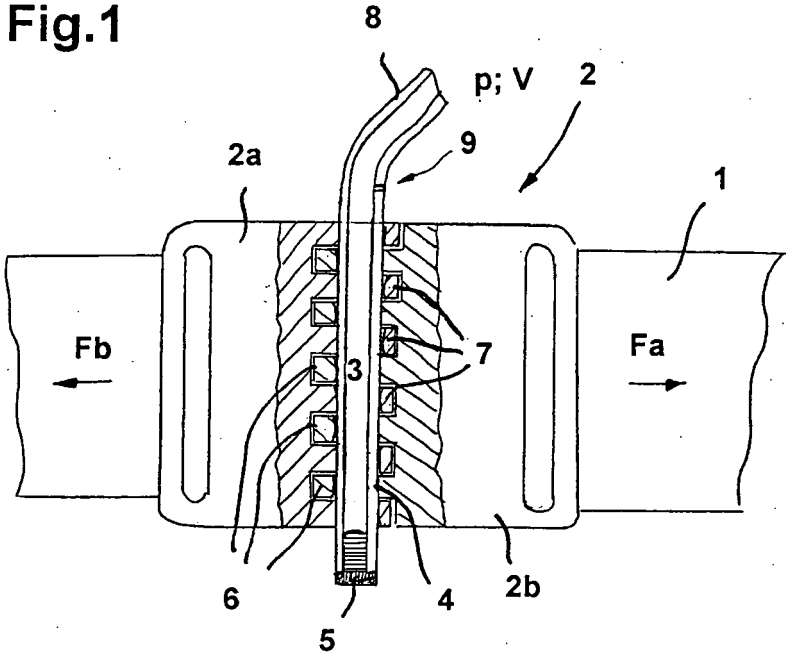
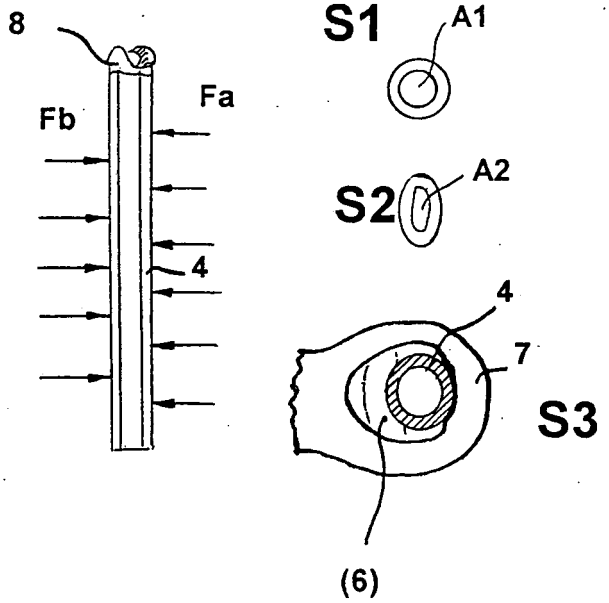


Fig.2



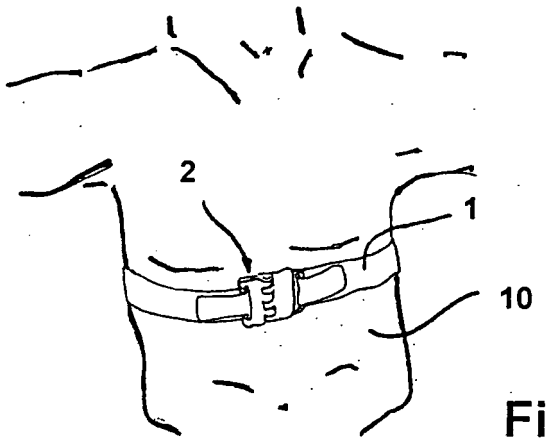


Fig.3

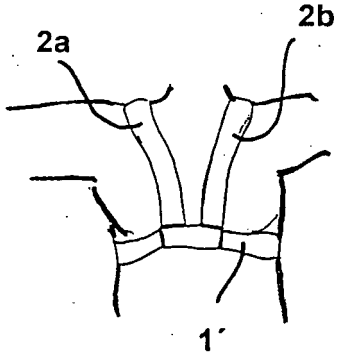


Fig.4

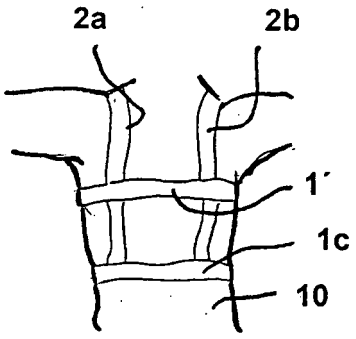
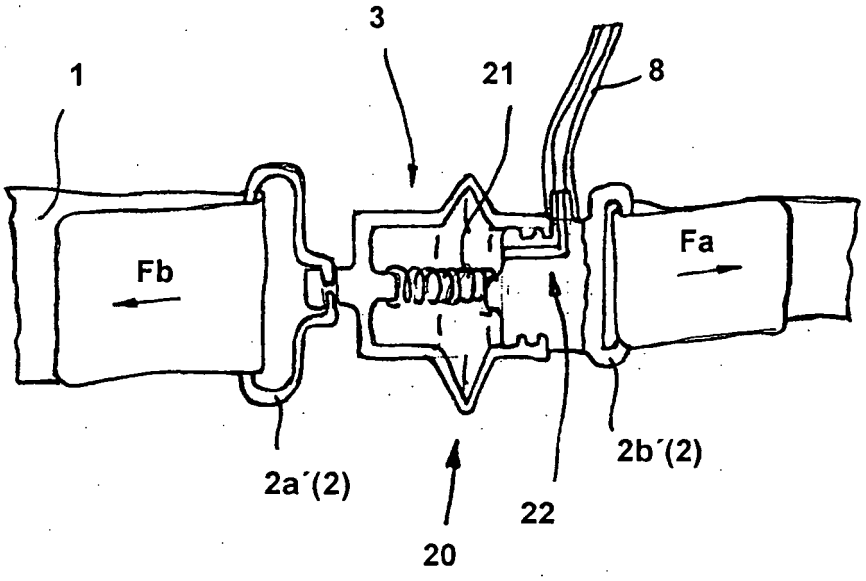


Fig.5

Fig.6



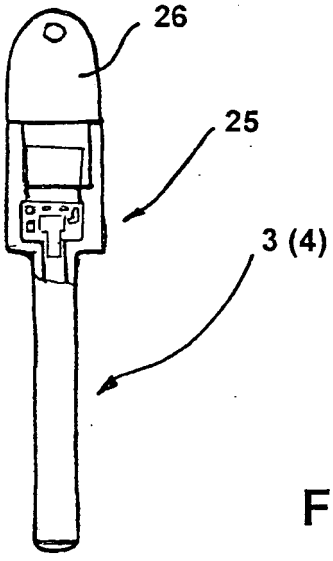


Fig.7

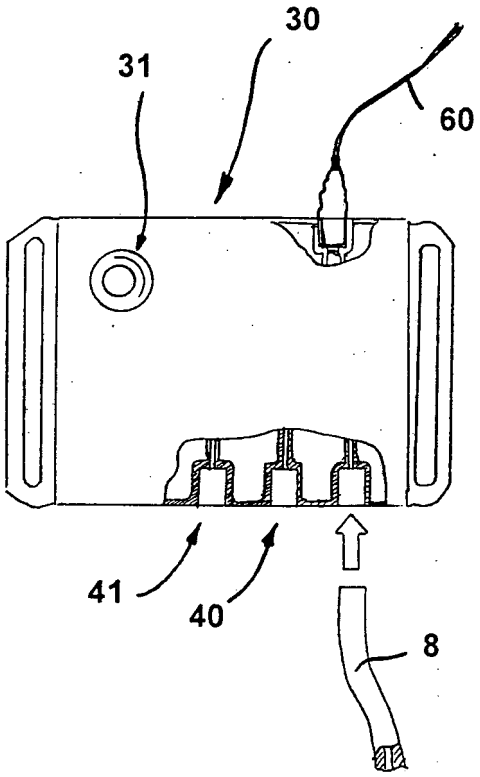


Fig.8

REFERENCES CITED IN THE DESCRIPTION

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